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THE RELATIONSHIP BETWEEN LIGHT DISTRIBUTIONS IN HOTEL GUESTROOM, EMOTIONS, AND INTENTION TO VISIT

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ABSTRACT

Lighting is an essential atmospheric design element in hotel guestrooms as it highly impacts guests' emotional and behavioral responses. While previous research on guestroom lighting suggests that hotel guests prefer warm-white light over cool color temperature, there is a lack of understanding of how different light distributions influence the guest's emotions and approach behavior.

Thus, this study investigates the effects of five different light distributions on the vertical and overhead planes on the guest's 9 emotional responses and how these emotions may impact their intention to visit. This research adopts its theoretical framework from the M-R model by Mehrabian and Russell (1974) and the PAD emotional state model. In addition, due to the increasing interest in creating personalized experiences for hotel guests, this study also explores how the social relationship of the guests (i.e., family VS couples) and the time of day on their preferred light distributions.

The online questionnaire was in Thai and English and recruited the respondents aged over 25 and non-designers, through the professional and social network. Some 345 respondents participated in the study; around 22% were non-Thai (e.g., Hong Kong and Taiwan). The statistical analysis (SPSS) used descriptive statistics, t-test, and Analysis of Variance (ANOVA).

The main findings indicated that 'pleasure', including the perception of spaciousness and privacy, positively influenced the intention to visit and associated with light distributions on the upper part of the room. For the social relationship, when the respondent assumed to stay with a family, most preferred the room with uplight to the perimeter walls, highly rated for perceived spaciousness. At the same time, when the same respondent was asked to choose a room to stay with a romantic partner, most chose the room with the indirect ambient light from a ceiling coffer, associated with high privacy. Furthermore, these preferred light distributions are also different between the activities in the evening and more relaxing time at night, where the most preferred scenes seem to focus on the lower walls and the floor. These findings provide a better understanding of how the guests, under different circumstances, may prefer different light distributions which can be useful for lighting designers and hotel operators. Future study should explore cultural differences on lighting preferences and decision-making of potential guests.

1. INTRODUCTION

The value of the global hospitality market is 3,486.77 billion USD in 2020 and is expected to grow to 4,135.5 billion USD in 2021, with 18.5% of compound annual growth rate (CARG) [1]. Asia-Pacific region has a long-term growth opportunity and strategically imperative for travel and tourism industry. In 2021, the business grew 46% and the value was at 12.1 billion USD, as the pandemic situation began to unravel[2].

Tourism is one of the most important industry in Thailand and it generates stream of revenue for the country. Moreover, the most significant proportion of the revenue is from the accommodation business, and tourists mostly choose a hotel concerning its accommodations and its physical appearance[3]. Hotel business is a "business of memories"[4] so the business tries to ensure that their guests receive a good and lasting memory and experience. To create beautiful and attractive appearance, hotel owners, architectures, and interior designers should work together to create designs that draw potential guests in and create impressive experience that they will remember and come back to. For lighting designer, it is necessary to enhance the aesthetic, create, and control atmosphere in the hotel rooms. The atmosphere was also a factor that influence consumers emotion and enhance their purchase ability[5]. It was also suggested that atmosphere might be a medium for attention, message, and affection. It could be used as a

marketing tool[6]. Emotion and behavior were influenced by the atmospheric environment, based on the SOR model that we will discuss further in this study[7-8].

In the past, there were studies about lighting in different scenarios such as conference room[9], working room[10], and study room[11]. In those study, the researchers used peripheral, overhead, and downlight. However, study about light distribution in hotel guestroom was difficult to find, as different types of room needed different lighting distribution. The same gap also applied in the study of light intensity, as it was found that light intensity and light temperature were suitable for different scenarios. Moreover, different light distributions were suitable for different social situation.

The objectives of this study are to investigate the impact of light distribution on subjective perception, to identify the relationship between the subjective perception and visit intention/behavior intention, the influence of social condition and time-based activities on the visit intention/behavior intention, and the influenced of social conditions and time-based activities on visit intention/behavior. This study can be beneficial in both theoretical and practical, as it investigates relationship of light distribution and human behavior while putting efforts to fill the gap for this area of study and provide practical guideline in light distribution for hotel owners and interior designers to develop attractive hotel rooms that guests will impress and revisit, as the room respond to their emotion and satisfaction, in the future.

2. THEORETICAL FRAMEWORK

2.1 S-O-R Model

To study the emotional and behavioral response through atmosphere, the SOR model (M-R model)[12] were used to explain the relationship of different atmospheric elements. The S stands for Stimuli, or the physical environment. The O stands for Organism, or the emotion. And R stands for Response, and it could be human reaction toward the environment, and decision to do something i.e., purchase more. The model describes how human respond to a factor that arouse their emotions. From the model relationship can be explained in 3 stages which are human perception towards an environment stimulus, the emotion states that arise when exposed to the stimuli, and human reactions toward the stimuli based on their emotions. The S-O-R model was widely adapted in many research. A research[13] used this model to describe the feelings and the reactions of his participants when they were exposed to different light distributions.

2.2 PAD Emotion Adjective Pair

As mentioned earlier, the S-O-R model were used to understand the emotion states of human when exposed to different stimuli. The Organism from the model composed of 3 dimensions – Pleasure, Arousal, and Dominance. Pleasure is used to describe when an individual feels pleased, good, happy in a situation. Arousal is the degree to which extent a person is excited, active, or stimulated. Dominance is the extent that the person is influenced such as in control, influential, or important. The SOR model was later extended. The former Organism from the original one was limited to only pleasure, arousal, and dominance, while the Response was limited to only approach or avoidance. However, human was much more complicated. So, more organism were added such as cognitions and perceived values, and added other responses such as loyalty, satisfaction, and behavioral intentions to the model. The extended version is called the PAD Paradigm.

A research about emotional response towards the use of color in a restaurant[8] adapt this model to the S-O-R model to explore the complexity of emotion and the behavior. They also used this model to display the linkage between the stimuli, the organism, and the response to further understand the relationship between emotion and response. They used this PAD Paradigm to understand the influence of retail atmosphere and the relationship between the stimuli, the organism, and the response. They also used it to determine the attractiveness of a set of colors that can affect the decisions of customers to approach or avoid the restaurant decorated in those colors.

2.3 Light distribution and its effect toward the subjective emotion of the users

Environmental lighting affected the perceptions and the behavior of the users, and their suggestions was that light could be a tool that enhance the selective process and affect the perception of an individual[10-11, 14-15].

2.3.1 Light uniformity and intimacy

Light distribution that can attract customers is an unexplored area in the hospitality field, and research in the servicescape area mostly do not address the lighting. In general, lighting was explored in terms of the level of illuminance of the restaurant overall, rather than a tool that can enhance the experience of the customer.

Ambience intimacy can be enhanced by lighting. It creates perceptions of an environment such as coziness, intimacy, and warmth. Luminance level (high and low) and lighting distribution (uniformity and non-uniformity) are the two lighting factors[16-17]. Social intimacy can be facilitated by luminance. For example, the sense of privacy can be conveyed by the use of low light while brightness increases the level of public self-awareness.

Light uniformity is the area of concern by hospitality business and restaurant in terms of visual perception. Uniformity in light distribution is maintaining a constant illuminance in an interior space while non-uniformity is the lighting that is unevenly distributed in the different areas of a room. Different lighting suits different social circumstances[15]. Uniform light associates with clarity and cognitive alertness[11], while non-uniform light associates with privacy[11]. In the context of restaurant, the results from the previous studies revealed that the customers were attracted to the non-uniform light and dim ambient, and the lightings were found to be intimacy and increase intention to visit. Moreover, users preferred uniformity light in the office, and they preferred non-uniformity light in their residential area such as in the living room[16].

2.3.2 Overhead and Peripheral light distribution

Not only the light uniformity and the light intimacy, but research also paid attention to light configuration. Light configuration can be associated with emotional response from human, such as clarity, beauty, pleasantness, relaxation, and privacy (intimacy). Commonly, overhead and peripheral light distribution are used[18]. The peripheral light lit the walls only, and the overhead light lit only the center of the room. Different light installations resulted in different emotional response. The key dimensions of human response are peripheral/overhead, uniform/non-uniform, and bright/dim, and they concluded that a change of light intensity could shift the overall impression.

2.3.2.1 Pleasantness

Low light and high illuminance are associated with pleasantness, as well as overhead and peripheral light distribution[9-11]. Ceiling cove light and wall washing could create pleasantness as well. Moreover, 500 lux in the context of a restaurant could also create pleasantness[15].

2.3.2.2 Relaxations

Cove lighting (overhead light) was preferred to the general light or peripheral light [9, 11]. The lux should be at level 320, which is a low illuminance for a working area. For a conference room, downlight, and wall-washed light with low illuminance created relaxation. Light color seems to have an effect as well[10]. The color of the light source and distribution characteristics are more important than the illuminance level.

2.3.2.3 Attractiveness

Variety of brightness pattern can bring attractiveness and interest to a space. So, the use of non-uniform light could create a perception of attractiveness and interest.

2.3.2.4 Privacy

Our vision is linked to the horizontal lines. So, the use of different light configuration and non-uniformity light that create different contrast of brightness in a space can create the perception of intimacy. Overhead light also increase privacy, as users perceived that the environment around their body is darker. Less bright wall in the eye level enhance level of privacy[11].

3. METHODOLOGY

In this research, the researcher tested different lighting distribution such as peripheral light and downlight. The researcher also tested the perception of the participants in two different times of a day, which was the evening light scene and the night light scene, as well as the different intention of visiting, which was with family or lover. The researcher tried to determine their impression, stay decisions, word of mouth, and decisions to stay longer. Control variables are light temperature, light intensity, plan, perspective, room color, and the decoration style.

3.1 Study Participants

The researcher used convenience sampling method for this research and there were 345 participants. The participants were those who have potential to visit a hotel and were above 25 years old and they must not work or possess the knowledge of lighting, lighting design, architecture, or interior design to avoid bias. All participants must not have any visual impairments such as color blind. The research was conducted amidst the pandemic, so the questionnaire was enrolled with Google Forms.

3.2 Material and setting

The researcher used stimulation photos in this research as photos could help the participants focus, helped controlling potential distraction, and cost and time saving. Moreover, photographs were generated to represent the scenario accurately, using a 3D realistic computer rendering program.

In this research, the researcher experimented on five different light configurations, each configuration had two different times, evening time and nighttime. And the participants had to choose if they would visit with the family or the lover. The light configurations were included to indicate the emotion, the time would address the purpose of visiting, and for companion, it was included to further understand the intention to visit.

The photos focused on the bed area and other facilities that were unrelated to the research such as bar or kitchen were excluded, as shown in Figure 1 and Figure 2. The details of the rooms were as following:

1. Lighting configuration 'A' - Overhead light style 1 Configuration details: 80% of light intensity on ceiling cove light and 20% of accent lighting and decorative light (localize lighting)
2. Lighting configuration 'C' - Peripheral light style 1 Configuration details: 80% of linear wall and curtain – wall washing from top to down and 20% of accent lighting and decorative light (localize lighting)
3. Lighting configuration 'E' - Downlight (Conventional design) Configuration details: 80% of adjustable downlight – Direct light and 20% of decorative light (localize lighting)
4. Lighting configuration 'B' - Overhead light style 2 Configuration details: 60% of up light to the ceiling, 20% of accent lighting (directional) and 20% of decorative light (localize lighting)
5. Lighting configuration 'D' - Peripheral light style 2 Configuration details: 50% of linear cove light from bottom up – focusing on the middle part of the wall (40-degree band from seated position), 20% of up light wall washer on living area and 20% of decorative light (localize lighting)

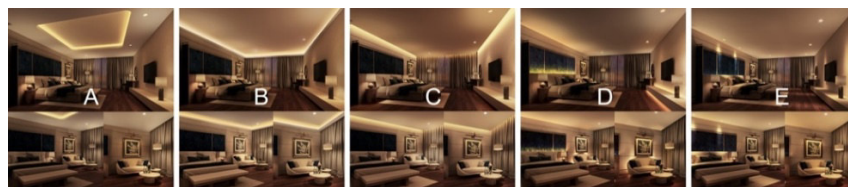


Figure 1 Five lighting distributions in evening

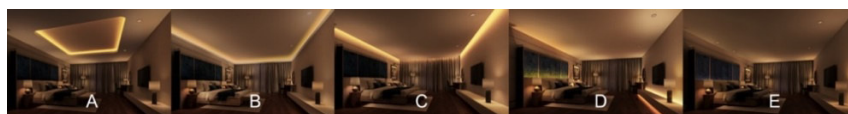


Figure 2 Five lighting distributions in nighttime

The area of the stimulated guestroom is 33m² or 355 Square Meter, with the height of 9' (2.7m). The wall had a white-beige color to create high reflecting area, with blue fabric headboard with low reflectance to create some contrast, which is commonly found in hotel guestrooms. All the five

pictures showed 3 perspectives, with 2 natural light environments – daytime and nighttime. The first perspective showed the overall area. The second picture show the perspective that focus the bed and the sofa area. The third picture focused on the living area. For the nighttime, the scene would have the same light configurator, but all the downlights were turned off. The indirect light was turn down 30% and the localize light was adjusted 50% down and its warm light became dim light, as it would normally function. The light temperature was 2700K and localized light was 2500K, as its function was dim to warm light.

3.3 Measurement

The participants must pass the 3 screening questions about their age, their profession, and if they had visual impairment. Then the questionnaire would ask them about their demographic. After that, they were assigned to imagine that they were visiting a hotel resort for their trip in Thailand.

Then the participants would be introduced to each type of room, one by one, randomly. They were asked to rate the 9 subjective emotions based on the PAD emotions, on the 7-point Likert scale, with 1 as the extremely negative and 7 as extremely positive. The 9 emotions were based on the PAD paradigm. P represented Pleasure – beautiful, pleasant, and relax. A represented Arousal – lively, spaciousness, and interesting. D represented Dominance – dominance, expensive, and privacy. All the PAD paradigm in the questionnaire were "Relaxed-Tense" (P3), "Privacy-Nonprivacy" (D3), "Spacious-Confined" (A2), "Dominant-Ordinary" (D1), "Interesting-uninteresting" (A3), "Expensive-Cheap" (D2), "Lively-Depress" (A1), "Beautiful-Ugly" (P1), and "Pleasant-Unpleasant" (P2). They all were selected from the past research and the opposite words for each pair to eliminate ambiguity.

After that, the participants were asked to rate 3 behavioral intentions composed of visit intention, recommendation, and stay longer, on the 5-point Likert scale, with 1 as the negative and 5 as positive agreement. Then the questionnaire would ask the participants about the scenario between the daytime and the nighttime, and their purpose to visit (family / lover).

3.4 Procedure

Participant were asked to adjust the brightness of their screen and were asked to proceed the questionnaire with iPad or computer for a broader display, so that they could see the pictures conveniently. In every change of picture question, they were asked to look at a blank black screen for 15 second to adjust their eye adaption. The questionnaire took about 15 minutes to complete.

3.5 Data analysis

All the data were analyzed with the use of SPSS, the Statistical Package for Social Science. The demographic characteristic of participants was described with descriptive statistic and the sample population was separated between Thai and non-Thai groups. The Cronbach's Alpha coefficient method was used to determine the reliability testing data. Subjective emotions and the PAD emotion of each room were tested on reliability. The dependent variables tested in the reliability coefficient ant the result was between 0.897-0.960 and the appropriate number should be over 0.70, which considered good to very good.

The PAD emotions were analyzed using t-test with a p-value < 0.05 to indicate significance. The ANOVA (analysis of variance) F-test was used to determine the linkage between light configuration and behavioral intention. The F-test was also used to determine the linkage between the demographic characteristics.

4. RESULT

4.1 Descriptive statistic

There were 345 participants in this questionnaire. 142 (41.2%) were male with 111 (41.3%) were Thai and 31 (40.8%) were non-Thai. 203 (58.8%) were female with 158 (58.7%) were Thai and 45 (59.2%) were non-Thai.

4.2 The effects of the light distributions toward emotional response

Mean (M) and Standard Deviation (SD) were used to investigate emotional response toward light distribution in a guestroom. The Room 4 with overhead light style 2 was associated with 'Beautiful', 'Pleasantness', 'Relaxation', 'Liveliness', and 'Expensiveness'. The Room 1 with overhead light style 1 was associated with 'Spaciousness', 'Expensiveness', and 'Privacy'. Lastly, the Room 5 with peripheral light style 2 was associated with 'Interesting' and 'Dominance'.

4.3 Emotional responses toward each style of room

To further understand the effect of the light configuration toward emotional response, the researcher would like to explore the light configuration in each room and the emotion that it associated with.

The Room A with overhead light style 1 was associated with the 'Privacy' ($t=104.04$, $p<.01$), followed by 'Expensiveness' ($t=91.69$, $p<.01$) and 'Spaciousness' ($t=89.37$, $p<.01$). The emotion that associated with the room the least was 'Liveliness'. When compared to other rooms, this room had the highest rate of privacy and spaciousness, including expensiveness. It can be assumed that because the room had an overhead light and low luminance on the wall hence the users perceived that sense of privacy. This finding also filled that gap that the past research found that spaciousness was associated with peripheral light on other types of room. For guestroom, overhead light is more suitable to create spaciousness.

The Room C with peripheral light style 1 was associated with the 'Spaciousness' ($t=98.15$, $p<.01$), followed by 'Privacy' ($t=95.35$, $p<.01$) and 'Expensiveness' ($t=87.91$, $p<.01$). The emotion that associated with the room the least was 'Liveliness'. In accordance with the past research, wall washing light is the light that associated with spaciousness.

The Room E with downlight style was associated with the 'Spaciousness' ($t=81.21$, $p<.01$), followed by 'Privacy' ($t=74.68$, $p<.01$) and 'Expensiveness' ($t=72.20$, $p<.01$). This room had a low score of 'Pleasantness', so it can be assumed that it was due to the use of non-uniformity lighting.

The Room B with overhead light style 2 was associated with the 'Spaciousness' ($t=87.31$, $p<.01$), followed by 'Privacy' ($t=80.44$, $p<.01$) and 'Relaxation' ($t=68.30$, $p<.01$). This room was also associated with 'Expensiveness', 'Beautiful', and 'Pleasantness' at a higher score when compared to the other rooms as well. It could be assumed that it was due to the use of indirect light and brightness illuminance on an overhead plane that enhanced the perception of beauty, spaciousness, and expensiveness.

The Room D with peripheral light style 2 was associated with the 'Privacy' ($t=81.61$, $p<.01$), followed by 'Spaciousness' ($t=75.02$, $p<.01$) and 'Pleasantness' ($t=63.30$, $p<.01$). The height of the light source was related to the sense of privacy, according to the field of visual (FOV). This lighting distribution could associate with 'Expensiveness' at the same time.

5. Findings

This study clearly showed that different light configuration results in different influence on subjective emotions. And it can be assumed that a room should create an emotional response of 'Spaciousness', 'Privacy', 'Relaxation', 'Expensiveness', 'Beautiful', and 'Pleasantness' to create a room that will create positive intention. And the peripheral light style 2 can respond to those feelings the most. To encourage the visit intention, the room should be associated with Pleasure, following by 'Beautiful', 'Pleasantness', and 'Relaxation'. Dominance could also encourage the intention to visit with 'Privacy' and 'Expensiveness'. These emotions also lead to recommendation. For intention to stay longer, it is found that Pleasure is highly significant. 'Pleasantness' and 'Relaxation', as well as 'Privacy'. 'Liveliness' and 'Interesting' also significant intention to stay longer.

For the result from finding different light configurations for different social circumstances, it is found that the Room D is suitable for family and the lighting in the Room A is suitable for lover in daytime. For the nighttime, the Room D is suitable for family and the Room C is suitable for lover, as shown in Figure 3 to Figure 5. It can be suggested to designers and hoteliers that for a nighttime scene, lowering ambient light and the downlight can be useful.



Figure 3 Light configuration for different time of a day and different social circumstances

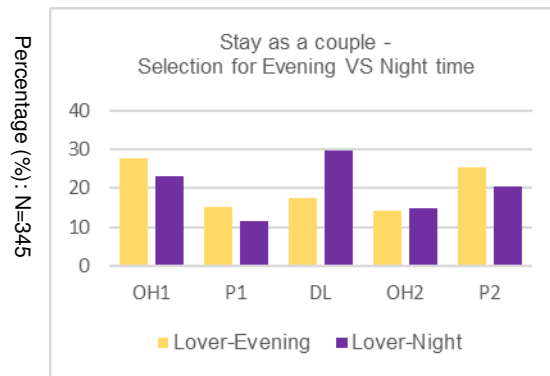


Figure 4 Chart of the preferred light configuration for couple in evening time and nighttime

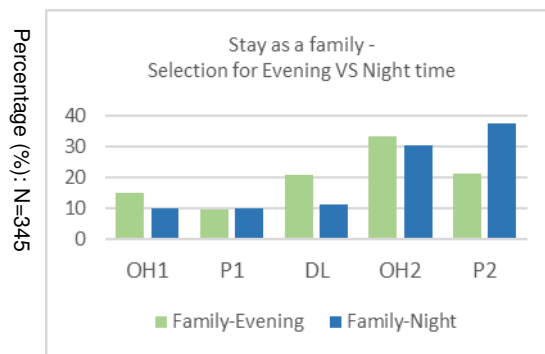


Figure 5 Chart of the preferred light configuration for family in evening time and nighttime

8. Conclusion

This study explores the light distribution and emotional-behavioral response in guestrooms regarding the M-R Model by Mehrabian and Russell (1974). This research investigated the relationship between lighting, emotional response, and intention to visit, based on the PAD model paradigm in marketing research. Moreover, this study also added the social circumstances as the purpose of visiting (with friends and family or with lover). This study also explored different preferences of lighting in different times of a day. As the research of emotion and light distribution are rare to find, especially for the hospitality business like hotel resort, this study aims to help designers and hoteliers to understand the importance of lighting that can aid their work or their business. Through the study, it is found that 'Pleasure' (beautiful, pleasantness, and relaxation) highly influenced positive behavioral intention. A room that emotionally respond to 'Spaciousness', 'Privacy', 'Relaxation', 'Expensiveness', 'Beautiful', and 'Pleasantness'. To create spaciousness, the use of overhead and peripheral light is useful, as long as the primary light is distributed in the upper visual field. Different time of a day requires different light distribution as well. Family and lover prefer overhead light with indirect light in the evening time. For nighttime, lowering downlight and indirect light is the most preferable for family, while lover prefers localize lighting. Family prefers lower level of light position with a bit of the illuminance from the cove light, as it increase the sense of security during the nighttime.

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